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ABSTRACT

This is the fourth in a series of technical research reports by Harvard Project Zero which study artistic creation and comprehension as a means toward better art education. This particular study examines children's sensitivity to musical styles. Twenty children at age levels ranging from 6 through 19 years participated in the study which measured their sensitivity to classical music. The results indicate that all age levels showed some sensitivity, with the three oldest age groups performing at a level which was significantly higher than the two younger age groups. Younger children showed a significant tendency to focus on a dominant figure and had strict criteria for judgments of style similarity. The conceptions of music held by children of different ages are discussed, and comparisons with sensitivity to style in other media are made. (Author/DE)

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Technical Report No. 4

THREE STUDIES OF PERCEPTION OF ARTISTIC STYLES

by

Howard Gardner

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HARVARD PROJECT ZERO
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Project Zero is a basic research program at the Harvard Graduate School of Education conducting a theoretical and experimental investigation of creation and comprehension in the arts and of means toward better education for artists and audiences. A brief explanation of the Project's development and current work, along with a list of other reports, can be found at the end of this document.

FOREWORD

This series of papers reflects my initial efforts to probe the sensitivity of children to stylistic aspects in various artistic media. The methods used in the studies differ somewhat from one another, reflecting both the specific demands of each medium and my continuing attempts to arrive at more effective methods of investigation. I believe, nonetheless, that the results point to certain general aspects of style sensitivity among children which I hope to make explicit in future work.

Howard Gardner
Cambridge, Massachusetts
April, 1971

Howard Gardner has recently completed his doctoral studies in Developmental Psychology at Harvard University. He is interested in the development of abilities involved in using symbol systems, particularly those employed in the arts.

Children's Sensitivity to Musical Styles

Abstract

Twenty Ss at each of five age levels (6 through 19) participated in a study of sensitivity to classical musical styles. Ss at all age levels showed some sensitivity, with the three older age groups (11, 14, and 18-19 years) performing at the same level, significantly higher than the two younger age groups (6, 8 years). Ss at the three younger age levels showed a significant tendency to focus on a dominant figure (a voice) in the selections; younger Ss had strict criteria for judgments of style similarity; females scored somewhat higher than males. The conceptions of music held by children of different ages are discussed and comparisons with sensitivity to style in other media are made.

CHILDREN'S SENSITIVITY TO MUSICAL STYLES[1]

Two domains about which little is known constitute the subject matter of this report: children's perception of music; children's ability to detect artistic styles. While there has been scattered research on children's musical capacities, most of the experimental literature deals with "atomistic capacities": rhythm duplication, pitch or loudness discrimination (Gardner, 1971a; Hattwick and Williams, 1935). When musical works have been used in investigations, interest has centered on children's preferences (Baumann, 1960) or on their skill at recognizing instruments (Fullard, 1967). The research which has focussed most directly on children's cognition of music is Pflederer's exploration of Piagetian conservation and musical intelligence (1964, 1967). Using simple rhythmic patterns and melodies, Pflederer has demonstrated that preoperational children do not recognize the invariance of particular musical aspects across certain transformations (e.g., augmentation, shift of key or time values). Pflederer's imaginative study is limited in that it examines only two age groups and uses simple patterns rather than intact musical selections.

Equally fragmentary is the literature on children's perception of style in various art forms. There is evidence that preadolescent children neither speak of style nor spontaneously classify works on that basis (Machotka, 1963; Gardner and Gardner 1970). Various findings also suggest that children at or before the concrete operational level tend to focus on the dominant figure or subject matter of a work and experience difficulty in breaking away from this aspect (Werner, 1948; Gardner, 1970a). Recent work challenges the conclusiveness of these findings, however; Gardner (1971b) was able to train seven year old Ss to sort paintings by style, even in the face of competing figural clues, and Gardner and Gardner have also discerned a certain degree of sensitivity to literary and painting styles among six year old children (Gardner and Gardner 1970; Gardner 1970a). These results have engendered interest in the general properties of stylistic sensitivity (Gardner 1971c) and in the possibility that similar trends are discernible in a child's relationship to musical works.

A paradigm was devised to study children's sensitivity to musical styles. Style sensitivity was operationalized as the ability to judge whether two fragments of music came from the same composition; musical figure was defined as a solo voice against an instrumental background. Except for the practice items and two unscored test items, the music was drawn from the repertoire of classical music written between 1680 and 1960. This musical genre was employed for a number of reasons: a range of samples could be matched on pertinent aspects; Ss would be unfamiliar with the selections, yet would not find them totally foreign; investigation of

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[1] I would like to thank Miss Donna Bridgeman for her help throughout the course of the research; Mr. J. Cullinane, Mr. R. Frost, and Mr. F. Zervas of the Newton, Mass. school system for their generous aid with arrangements; Drs. Kurt Fischer, David Perkins, and Jeanne Bamberger for their constructive comments.

the relationship between time of composition of two pieces and the extent of style sensitivity would be possible.

The investigation was directed at the following questions: What is the developmental trajectory of musical style sensitivity? Will Ss improve their style sensitivity through a second exposure to selections? Are Ss better able to recognize as different examples which come from widely separate eras than examples composed at approximately the same time? Is there a tendency among younger Ss to focus on the dominant figure in a piece of music and to disregard more general microstructural aspects which characterize both the figure and its background (texture)? How do children of different ages conceive of the realm of classical music? Throughout the study a comparative perspective was maintained with regard to findings on sensitivity to painting styles.

Methods

Subjects: Ten males and ten females at each of five age levels (modal ages 6, 8, 11, 14, and 18-19) participated in the study. The oldest Ss were sophomores attending Harvard and Radcliffe colleges; the younger Ss were randomly drawn from the appropriate classrooms in two public schools in a Boston suburb. Subjects were overwhelmingly middle class and of high intelligence. This population was selected in the hope that Ss would be favorably disposed toward classical music and motivated to perform well on a difficult task.

Materials: The test materials consisted of sixteen pairs of musical selections transferred from long-playing records onto a Uher tape recorder. Each pair consisted of two halves fifteen seconds in duration separated by a bell which lasted approximately one second. The music was representative of Western symphonic classical music; no composer was used more than once; passages which could not be identified by three undergraduate judges were used; all composers had at least five entries in a leading record guide.

To prevent response bias from raising scores, eight of the pairs consisted of halves from the same piece (S) while the remaining eight pairs consisted of halves from different compositions by different composers (D). The first half of an S pair began at a selected spot on the record (manner of selection is described below). After fifteen seconds had elapsed a bell was rung and the recording ceased; it was resumed for fifteen seconds after another thirty seconds had elapsed on the record. The S heard "x to x + 15 seconds...a bell... x + 45 seconds to x + 60 seconds", where X was the point at which recording was begun. This procedure insured there would be a clear break in the melodic line of the musical stimulus but that not all aspects of the composition would change. In all cases both halves of the selections came from the same movement and the same record band of the piece.

Four of the S pairs and four of the D pairs were exclusively instrumental (I), having three or more instruments playing. The remaining 4S and 4D pairs were mixed (M), featuring a soloist singing with the orchestra only in the first or in the second half of the pair. In line with earlier investigations using paintings, it was hypothesized that younger Ss would assume a pair having a musical figure in one but not the other half could not have come from the same composition.

The particular spot on the record where recording was to begin was first selected for the 4 SM pairs. The spot was chosen randomly, consistent with the following conditions: it could not be at the beginning of the record nor within one minute of the closing band; it had to be so located that one portion was instrumental while the other included a solo voice. Once different starting points had been determined for the 4 SM pairs, the same starting points were used for the 4 SI pairs. The recording of the 4 DI and 4 DM pairs also began at these starting points, except that the lapse of time from the beginning of the band was calculated on two separate records: x to x + 15 on record 1, x + 45 to x + 60 on record 2. This procedure was designed to eliminate the possibility that selections would be biased in terms of their position in the composition.

Representativeness was achieved by choosing one M and one I of the S pairs from each of four periods: Baroque (1680-1750); Classical (1750-1820); Romantic (1820-1890); Modern (1890-1960). These periods were also drawn on for the D pairs: two pairs (one M and one I) came from the same period, two from one period apart, two from two periods apart, and two from three periods apart. It was hypothesized that Ss would be more likely to recognize pieces composed in widely separated eras as from different composers than pieces composed in the same era. While it was impossible to insure that no item could be answered correctly simply through attention to one musical aspect, the pairs were so selected that exclusive attention to a specific aspect like rhythm or melody would not yield a high score. A list of the item types and composers used is found in Table 1; in the actual testing, item types were randomly ordered.

TABLE 1

ITEMS USED IN THE STUDY

Item	Same	Different
	Instrumental	
Baroque:	Vivaldi	Same era: Schumann-Brahms
Classical:	Stamitz	One era apart: Corelli-Beethoven
Romantic:	Bruckner	Two eras apart: Stravinsky-Boccherini
Modern:	Bartok	Three eras apart: Tartini-Schoenberg
	Mixed	
Baroque:	Scarlatti	Same era: Haydn-Gluck
Classical:	Mozart	One era apart: Hindemith-Mascagni
Romantic:	Meyerbeer	Two eras apart: Handel-Berlioz
Modern:	Berg	Three eras apart: Boulez-Bach

Procedure: After probing S's musical training and interests, E told him, "I am going to play some bits of music for you. I want you to listen carefully to the bits and then tell me if you think they came from the same piece of music." S then heard two illustrative examples using familiar melodies. After the practice items Ss were asked to paraphrase the instructions; testing did not begin until Ss had produced an accurate paraphrase. Each S had produced an accurate paraphrase. Each S was told that some of the items would come from the same piece of music, others from different pieces; that the items would be largely unfamiliar; that if he achieved a certain score he would get a special prize; that he would have a chance to hear all the items again (the latter instruction was not told to the youngest Ss); Ss were not told of their success on each item but were generally encouraged. After each item S was asked the reasons for his decision.

Results

Testing of Hypotheses: To determine the general trajectory of musical style sensitivity, a two-way analysis of variance was performed on S's scores (number of correct answers) during the first administration of the test. There was a significant difference across age levels ($F=9.87$, $df= 4, 90$, $p < .01$) and the females approached performing significantly better than the males ($F=3.52$, $df=1, 90$, $p < .07$). As Ss had heard the series twice, each S's higher total score was noted and another two-way analysis was performed on this set of scores yielding confirmatory findings (Age: $p < .01$; Sex $p < .10$). T-tests and sign tests both indicated that at no age level and in neither sex group did Ss significantly improve their scores on a second hearing; indeed, with the exception of the oldest Ss (ten of whom improved on a second hearing), Ss tended to receive poorer scores on a second hearing, and the 8 year olds performed significantly worse ($z=1.94$, $p \approx .05$, two tailed). Furthermore, because of the length and difficulty of the test, the youngest Ss only heard the selections once. Since the second hearing did not have a positive effect, all further analyses were carried out only on the scores of the first hearing; comparison across all five age levels was therefore possible on the other hypotheses. A list of means at each age level is provided in Table 2.

TABLE 2

MEAN NUMBER OF ERRORS

Group	Presentation		
	Presentation 1	Presentation 2	Higher Score
Sophomore males	3.8	4	3.3
Sophomore females	3.8	2.8	2.7
14 year old males	4.6	4.4	3.6
14 year old females	3.8	4.2	3.3
11 year old males	3.8	4.3	3.6
11 year old females	3.4	3.8	3.0
8 year old males	6.1	6.2	5.3
8 year old females	4.8	5.7	4.6
6 year old males	6.6		
6 year old females	6.0		

A Newman-Keuls comparison of means provides additional information about the developmental trajectory. The three oldest age groups (11, 14, 18-19) performed at virtually the same level on the style test, with the 11 year olds having a slightly higher absolute score. The 6 and 8 year olds'scores were significantly lower ($p < .05$) but did not differ significantly from one another. The mean scores were well above chance level, and even among the 6 year olds, only one S missed more than 8 items, and only two missed eight items.

The subtlety of style detection was probed by comparing S's scores on the four items which came from the same era or one era apart to the same S's scores on the four items which came from more widely divergent eras. A three-factor repeated-measures analysis of variance was performed on the S's scores in these two item categories, with age and sex as between subject variables and item type as a within subject variable. Neither age nor sex were significant variables but item type was found to be significant ($F=24.14$, $df= 1, 90$, $p < .01$) and the interaction of age and item type was found to be significant ($F= 3.52$, $df = 4, 90$, $p < .01$). T-tests at each age level indicated that the two oldest age

groups had a significant tendency to perform better on those items which came from widely divergent eras ($t \geq 2.71$, $df=38$, $p < .01$); the younger three age groups also showed a non-significant tendency in this direction.

The study probed whether Ss would predicate their stylistic judgments on the presence or absence of a dominant figure (a voice) in the two halves. A comparison was made of the number of "different" responses to the eight M items and the number of "different" responses to the eight I items. Again a three-factor repeated-measures analysis of variance was performed on the number of "different" responses in these two item types, with age and sex as between object variables and item type as a within subject variable. Age was found to be a significant factor ($F=6.10$, $df= 4, 90$, $p < .01$) and the interaction between age and item type proved significant ($F=2.78$, $df=4, 90$, $p < .025$). T-tests at each age level indicated that the three youngest age groups had a significant tendency to respond "different" more frequently on the M items ($t \geq 2.04$, $df = 38$, $p < .05$, two-tailed) while the two older groups showed only a slight, non-significant tendency in this direction.

An unanticipated finding was the strong tendency of younger Ss to give "different" responses. While 14 and 18-19 year olds showed no trend in this direction, Ss aged 11 and under showed significant tendencies to give more "different" than "same" responses ($z=2.01$, $p < .05$, two-tailed). Indeed it was not uncommon for young Ss to answer "different" on nearly every item; their scores exceeded chance because of an ability to answer "same" on the S items with the most similar halves. Thus, 3 six year olds gave 15 "different" responses and all three answered correctly on their one "same" response; 3 six year olds gave 14 "different" responses and two answered correctly on both "same" items, the third giving one correct and one wrong "same" answer. This response bias may indicate a "cut-off problem" on such tasks; despite the warning that some halves would come from the same piece, Ss may have too high a standard for answering "same" and insufficient appreciation of the differences possible within a composition.

Conceptions of Music: The children's explicit or implicit awareness of the components of a composition were inferred primarily from their answers and their reasons. The method of analysis and statistical distributions have been described elsewhere (Bridgeman and Gardner, 1971) but the general findings are worth summarizing here.

The 6 year olds had a stringent criterion for "same" judgments. Pieces had to sound identical or directly continuous in order to be judged as from the same composition; all pieces below this high "cut-off point" were judged different. Conceptions seemed undifferentiated; six Ss could give no reasons whatever and those who responded spoke primarily in terms of "high/low" "loud/soft" or "fast/slow" music.

Eight year olds often mentioned more than one dimension and were able to give "same" judgments even when the two segments did not sound continuous to them. Ss commonly described their perceptions using adjectives or metaphors drawn from outside music: "peppy", "dull", "churchy", "grown-up", "like a horse race". Children appeared to be assimilating and characterizing classical music on the basis of their personal experiences. Conceptions were somewhat differentiated, a range of properties were discerned, yet the child had a sense of the overall character of a selection.

Eleven year olds built upon the strategies of the 8 year olds. They were aware of several variables, explicitly acknowledged that discontinuous selections could come from the same piece, and frequently noted instrumentation, rhythmic aspects, and texture. The 11 year olds, unencumbered by knowledge of musical forms or terminology, appeared to listen attentively to the music, to retain it without difficulty, to avoid facile categorization, and to think of music in its own (rather than in personal or historical) terms.

Considerable differences in strategy separated the adolescents from the younger Ss. Both high school and college students took into account a large number of variables and considered their interrelations. Ss spoke frequently in terms of musical schools (baroque, jazz) and aspects (harmony, melody, staccato). The relative superiority of the college sophomores appears due to greater knowledge about the realm of music, more accomplished handling of the relevant variables, a more refined notion of what was possible in a piece. Unlike younger Ss, the older groups were continuously considering what the first segment of the pair implied; they would point out "this melody couldn't follow from the first one", or "That's a variation of the earlier theme". Their point of departure was their awareness of musical categories, rather than the specific aspects of each stimulus. Ss had a sense of a musical piece as a structured entity which possesses continuities, direction, possibilities, and implications.

A non-productive aspect of such sophistication was that it made the determination of a cut-off point difficult; Ss might indicate that two fragments which came from the same era "could have come from different movements of the same piece" or to speculate that two selections from the same piece might have been "Bach and Handel" or "Mozart and Haydn". This excessive introspectiveness may be one reason why, using an alternative approach, less sophisticated 11 year olds did not perform significantly worse than undergraduates.

Discussion

The most dramatic finding was the overall excellence of Ss at the task. Though no prior norms existed, colleagues who heard the sample items anticipated grave difficulties with the test. Yet even first graders showed some style sensitivity and the average scores at the higher age levels were strikingly high. No doubt the success at the task was due in part to the gifted subject population; a less intelligent or motivated sample might have fared differently. Still it is notable that 6 and 8 year olds were evidently making reasonable judgments about the properties of musical works

under demanding experimental conditions. Though one might infer that the test is easy, this conclusion is unwarranted; no S answered all items correctly and the more sophisticated adult and college Ss indicated that they found the test challenging. The evidence suggests that in some way young children can discriminate cues in the musical stimulus and make a considered judgment about their probable source.

What are the cues in the musical stimulus? As a dense symbolic medium, music contains an indefinite number of cues for the attentive listener (Goodman, 1968). Though rhythm, melody, instrumentation, and volume are probably the most prominent cues, the listener may also take into account details of ornamentation or interaction among instruments or any other perceptible element. For this reason one can not state with confidence on what basis a stylistic judgment is made, nor can one insure that a certain aspect is or is not a cue. All the same the guidelines followed in item selection render it likely that only Ss who attended to a variety of cues would be able to render consistently successful judgments.

As in other tests of style sensitivity, a competing cue was introduced in order to test the strength of style detection. In the absence of the competing vocal cue, stylistic judgment was tantamount to a general similarity decision; in its presence, however, the successful style detector had to overlook or at least defocus from the dominant figure in order to consider more general textural aspects of the composition. As hypothesized, younger Ss did gravitate to the figure and often based their judgments on it. The tendency was somewhat less pervasive than in studies of sensitivity to painting styles, probably because the objects represented in pictures are more dominant figures than are voices in a work of music. In fact some Ss seem not to have noticed the voices, while Ss have found "objects" or "figures" even in the most abstract paintings. It is possible that many other aspects -- loudness, instrumentation, rhythm -- can act as figure in a musical work (Vernon, 1934) yet as likely that figural aspects *per se* are less pivotal in the perception of music than in perception of the plastic arts. Conversely general textural or microstructural properties appear relatively more salient in auditory forms (Gardner, 1971b).

Ss' difficulties in giving elaborate reasons for their choices, even though they felt confident about them, underscores the problem of verbalizing reactions to art forms. Often Ss would indicate that two pieces "felt" the same or had a different "shape" but were unable to go beyond these vague characterizations. Rather than dismissing such comments as uninstructive, it might be profitable to take these Ss at their word. An important consideration in the perception of the arts is how works "feel" and an important consideration in perceiving styles is whether two works feel differently or have distinctive Gestalten. More imaginative Ss can indicate that a selection is more appropriate for a commercial or for a romance, that it is reminiscent of a church or amusement park. These individuals are creating metaphors in order to share their experience of the works. It is perhaps most reasonable not to penalize Ss who are unable to articulate their reactions and to attribute certain Ss' abilities to describe the effects of music to their greater imaginativeness rather than to heightened musical understanding.

Despite the intent of the test, it is conceivable that a person could be very sensitive to music and yet perform poorly. An S might have listened with great keenness and yet placed his "cut-off" criteria at the wrong level. The test sought to minimize this tendency by indicating the heterogeneity of the items and allowing Ss to hear the set a second time. There is evidence that older Ss may have benefited slightly from a second hearing; younger Ss clearly did not, but this outcome more likely reflects fatigue or boredom than a less accurate placement of the cut-off point upon a second listening.

The necessity for proper location of a cut-off point can be discussed with older Ss but not with those who are confused rather than enlightened by abstract verbal discourse. If testing is done over a longer period of time, one can aid S in fixing the threshold through exposure with correction to numerous items (Gardner, 1971b). The higher performance of Ss is the best evidence that the cut-off problem was not a serious one; it also seems likely that this phenomenon affects sophisticated as well as naive Ss and so, except perhaps for the youngest group, did not interfere with the general trends discerned here.

The evidence reflects that style recognition is a complex cognitive process which demands monitoring of numerous aspects of a stimulus, avoidance of over-emphasis upon a single facet, and attention to the general expressive features of the work. The present study confirms earlier findings that primary school children have some capacity to make the kinds of similarity judgments involved in stylistic assessment and that they are likely to attend to certain dominant facets of the stimulus. Their impressive performance on the present task appears to reflect both the high intelligence of the particular population and the possibility that figural properties are relatively less dominant in the auditory than in the plastic arts. The results suggest that two approaches can be effective in musical style detection: response in terms of personal experience and the properties of musical stimuli per se, as practiced by younger Ss; response in terms of the categories of musical history and analysis, as practiced by the older Ss. As in earlier investigations, females performed somewhat more skillfully at the task; this finding may reflect the quicker maturation of girls, the value placed by the culture on aesthetic interest for girls, and an ability to listen more carefully and learn more quickly during the experimental session.

Though high intelligence and operational thinking undoubtedly contribute to style sensitivity, the particular subject matter being investigated should not be overlooked. There are now a number of studies which show that children are sensitive at an early age to aspects of artistic objects (Gardner, 1970b). The present investigation reinforces this impression of a compatibility between children and artistic objects which may be an important developmental phenomenon. Since music is generally considered the "purest" of the art forms, one might expect that children's natural sensitivity to art objects should be manifest first in that realm.

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PROJECT ZERO

Harvard Project Zero is a basic research program at the Harvard Graduate School of Education investigating creation and comprehension in the arts and means toward better arts education. Four years ago, Project Zero commenced its search for communicable general principles that could provide some guidance in the design and evaluation of programs for artist and audience education. Such principles, we felt, should be based on a fundamental study of the nature of human abilities important to the various arts, a study investigating relationships of transfer or inhibition among those abilities and seeking means for fostering such abilities. Our effort has involved conceptual analyses, the survey of relevant experimentation and literature in Psychology and other fields, design and sometimes execution of experiments, and visits to institutions engaged in art education.

One starting point of our study was the systematic analysis of types of symbolism and symbol processing in Languages of Art, by Project Director Nelson Goodman, Professor of Philosophy and Research Associate in Education at Harvard University. We have considered such other subjects as the differential impairment of abilities under various types of brain damage, the role of problem solving in artistic endeavor, relations between the psychology of vision and the visual arts, perception of rhythm in music, and style recognition in various media. Though the development of actual curricula in arts education is not a primary concern, the Project does contribute to the field of practical education by responding when possible to requests for consultation and by suggesting needed programs. The Harvard Summer School Institute in Arts Administration was established at the recommendation and with the cooperation of the Project.

The Project sponsors a series of lecture-performances in various media, designed to give the general public and prospective public school teachers and administrators better insight into and attitude toward artists and the arts. As the series title, "Art in the Making" suggests, the purpose of the lecture-demonstrations is to reveal something of the artist's way of working, rather than to display his products. This work with artists in an educational context also brings our theoretical research into constant contact with practical and artistic realities.

PROJECT ZERO TECHNICAL REPORTS

1. Vernon A. Howard, Harvard Project Zero: A Fresh Look at Art Education
2. Barbara Leondar, The Arts in Alternative Schools: Some Observations
3. Howard Gardner, The Development of Sensitivity to Figural and Stylistic Aspects of Paintings
4. Howard Gardner, Three Studies of Perception of Artistic Styles

The following reports are forthcoming:

5. David Perkins, Cubic Corners
   The Perception of Line Drawings of Simple Space Forms
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6. Vernon A. Howard, On Musical Expression
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